selecting pixels based on a selector plane that identifies, for each part of the original image, whether the original image information is maintained in an upper plane or a combination of the upper and at least one lower plane of said plural planes.

46. The computer readable media and instructions according to Claim 43, wherein said instruction further cause the computer to perform the step of:

decompressing said plural planes, including at least an upper plane and a lower plane, from a compressed state.

47. The computer readable media and instructions according to Claim 46, wherein:

said step of selecting comprises,

combining said upper and lower decompressed planes to produce an additive image, and

selecting pixels of the reconstructed image from corresponding pixel locations of one of said decompressed upper plane and said additive image.

Remarks

The above Amendments and these Remarks are in reply to the Office Action mailed August 29, 2001. No fee is due for the addition of any new claims. An appropriate Petition for Extension of Time to Respond is submitted herewith, together with the appropriate fee.

I. Summary of Examiner's Rejections

A. In the Office Action, the Examiner rejected Claims 15-20, 30-33, 36-38, and 43-47.

B. The Examiner has rejected Claims 15-20, 30-32, 36-38, and 43-47 are rejected under 35 U.S.C. § 102(e) as being anticipated by *MacLeod et al.*, U.S. Patent No. 5,778,092.

C. The Examiner has rejected Claim 33 under 35 U.S.C. § 103(a) as being unpatentable over *MacLeod et al.* in view of *O'Mahony*, PCT Application WO 94/06111.

D. Claims 16 and 44 have been cancelled and Claims 15, 37, and 43 have been amended, leaving Claims 15, 17-20, 30-33, 36-38, 43, and 45-47 for the Examiner's consideration. Reconsideration of the rejections is requested.

II. Response to Rejection of Claims 15-20, 30-32, 36-38, and 43-47 under 35 U.S.C. § 102(e)

The Examiner has rejected the above claims as anticipated by *MacLeod et al.* Because the cited art does not disclose all of the limitations of the Applicants' claims, the Applicants assert that the claims are patentable over the prior art.

According to the specification, the Applicants' invention involves the representation of digital images in compressed format. The main difficulty with the representation of digital images in compressed format is selecting an appropriate compression technique. For example, binary compression schemes such as LZW are very effective in dealing with text and line-art information, while JPEG has been successfully developed to encode natural photographs. (p.2, lines 13-17). However, these algorithms have been designed to perform well on a particular class (be it textual or pictorial) of images - and no single algorithm can possibly handle all types of image classes reasonably well. (p.2, lines 17-21).

One approach to achieving high compression is to divide the image into several image planes, each containing a different portion of the image, and then to apply the most appropriate compression technique to each image plane separately. (p.2, lines 22-25). The image is reconstructed by selecting data from one of the separate image planes. Figure 2 of the Applicants' specification illustrates an embodiment of this approach in which a binary selector plane is used to select data from either an upper plane or a lower plane on a pixel by pixel basis. (p.12, line 23 - p.13, line 1).

With many types of compression techniques, compression may be improved by modifying the image data in each plane to conform with compression-related constraints, such as limiting the number of line-art pixels or forcing pixels to be the same color; however, this modification introduces an immediate representation error which is carried forward to the output. (p.14, line 15 - p.15, line 3) Since this approach is forced to choose between a pixel in the upper plane or the lower plane, this approach "lacks the ability to compensate for desirable adjustments (such as due to compression-related constraints) in the way pixels are classified." (p.15, lines 4-6).

The Applicants' invention is directed towards an improvement of prior image reconstruction models. In an embodiment, "information from an upper plane is first (prior to making the selection) added to the content of a lower plane." (p.15, lines 9-12). As illustrated in Applicants' Figure 3a, the binary selector plane is used to select data from either the lower plane or the sum of the lower plane and the upper plane. In comparison with prior reconstruction models, as illustrated by Figure 2, this embodiment includes the introduction of an adder, which provides a mechanism to correct for representation errors resulting from classification adjustments. (p.15, lines 12-18).

Thus, in one aspect, the selector plane selects, for each output pixel, data from either a single plane or from an arithmetic operation of pixels from several planes. For example, as amended, Claim 15 recites:

> A method for reconstruction of an image, comprising the steps of:
> selecting pixels of the image to be reconstructed from plural planes of data representing the image, wherein said step of selecting comprises selecting pixels of the image from one of a single plane and an arithmetic operation of pixels from more than one than one of said plural planes. (Emphasis Added).

Independent claims 30, 36, and 43 all recite similar limitations. Because the cited art does not disclose all of the limitations of the Applicants' claims, the Applicants assert that the claims are patentable over the prior art.

The Examiner cites *MacLeod et al.*, Col. 4, lines 43-53, and Fig. 25b, Col. 15, lines 1-18, as disclosing "selecting pixels of the image from one of a signal plane and an arithmetic operation of pixels from more than one of said plural planes." The Applicants respectfully submit that *MacLeod et al.* does not disclose this claim element.

MacLeod et al. discloses a "technique for compressing scanned representations of color or gray scale documents." (Col. 3, lines 48-49). In an embodiment of *MacLeod et al.*, "the pixel map representing a color or gray-scale document is decomposed into a three plane page format . . . comprised of a 'foreground' plane, a 'background' plane, and a 'selector' plane." (Col. 4, lines 11-15). The foreground and background plane each contain image information, "stored at the same bit depth and number of colors as the original raw pixel map." (Col. 4, lines 16-17). The selector plane, in contrast, is stored as a bitmap, a binary pixel map in which pixels can take one of two values, 1 or 0. (Col. 4, lines 18-19 and lines 8-10).

According to *MacLeod et al.*, "the purpose of the selector plane is to describe, for each pixel in the selector plane, whether to use the pixel value found in the background plane or the

foreground plane." (Col. 4, lines 44-47). In this embodiment, *MacLeod et al.* uses "the selector plane to switch between the foreground and background images." (Col. 14, lines 61-63). During decompression, "the decompressed image is then created using the contents of the selector plane to determine the ultimate pixel value between corresponding pixels in the foreground plane and the background plane." (Col. 14, lines 53-57). For each pixel in the decompressed image, "a 'white' pixel in the selector plane (i.e. a logical zero value) means the pixel value should be taken from the corresponding pixel from the background plane." (Col. 4, lines 47-50). Conversely, "a 'black' pixel in the selector plane (i.e. a logical one value) means that the pixel value should be taken from the corresponding pixel from the foreground plane."

In this embodiment of *MacLeod et al.*, the selector plane is used to choose between a pixel in the foreground plane or a pixel in the background plane. The choice between a foreground pixel and a background pixels is exclusive. The selector plane can choose a foreground pixel or a background pixel, but not both. This embodiment of *MacLeod et al.* does not disclose performing any sort of arithmetic operation of pixels from more than one plane.

An alternate embodiment of *MacLeod et al.* creates a decompressed "output at a lower resolution when the document image is displayed on a computer based display system.." (Col. 14, lines 66-67). In this embodiment, a gray-value pixel map is created from the selector plane. (Fig. 25b, step 2510). The binary-valued selector plane is reduced in resolution to form a gray-scale value pixel map. The gray-scale value of each gray-value pixel is determined by computing the scaled sum of the binary pixels of the selector plane contributing to the gray-value pixel. (Col. 15, lines 3-7). The pixels of the decompressed image are computed as "a weighted average of the foreground and background values corresponding to the gray-valued pixel." (Col. 15, lines 9-12). In this embodiment, the gray-valued pixel is used to weight the sum of the foreground and background pixels.

This embodiment of *MacLeod et al.* performs a weighted average between corresponding pixels of the foreground and background plane in order to produce the output image. This weighted average is computed for every pixel of the output image. As stated by *MacLeod et al.* in Step 2511 of Figure 25b, "for each output pixel compute output pixel as weighted average of foreground and background pixel value." (Emphasis Added). Since every pixel of the output image is a weighted average of foreground and background pixels, it follows that every output pixel is an arithmetic combination of the foreground and background pixels. Because every pixel in this embodiment is an arithmetic combination of the foreground and background pixels, there is no selection between pixels of a single plane and an arithmetic operation of pixels from more than one of said plural planes.

Thus, *MacLeod et al.* discloses two alternate embodiments. In one embodiment, *MacLeod et al.* discloses selecting an output pixel from either a foreground plane or a background plane, but does not disclose an arithmetic operation of pixels from more than one plane. In the alternate embodiment of *MacLeod et al.*, every output pixel is computed via an arithmetic combination of pixels from the foreground and background plane and there is no selection of pixel values solely from a single plane. However, there is no single embodiment in *MacLeod et al.* which teaches both "selecting pixels of the image" and "an arithmetic operation of pixels from more than one than one of said plural planes," as required by the presently pending claims.

In order to anticipate a claim, the reference must teach every element of the claim. See MPEP §2131. Moreover, "the elements must be arranged as required by the claim." *In re Bond*, 910 F.2d 831, 15 U.S.P.Q.2d 1566 (Fed. Cir. 1990); See MPEP §2131. It is improper to take separate claim elements from different embodiments of a reference and combine them when the embodiments do not relate to each other. *Ecolochem, Inc. v. Southern California Edison Co.*, 227 F.3d 1361, 56 U.S.P.Q.2d 1065 (Fed. Cir. 2000). In the present case, the Examiner has taken

the element of "selecting pixels of the image" from one embodiment of *MacLeod et al.* and the element of "an arithmetic operation of pixels from more than one than one of said plural planes" from a separate, unrelated embodiment. Since the combination of claim elements from unrelated embodiments does not properly anticipate a claim, it is respectfully submitted that Claims 15, 30, 36, and 43 are not anticipated by *MacLeod et al.*

Additionally, *MacLeod et al.* does not render the invention as defined in Claims 15, 30, 36, and 43 obvious to one of average skill in the art because there is nothing in the art which teaches, explicitly or implicitly, the modification of the reference. Specifically, there is no motivation in the art or in *MacLeod et al.* to combine the separate embodiments of *MacLeod et al.* in order to disclose the inventions of Claims 15, 30, 36, and 43.

In order to establish a *prima facie* case of obviousness, the Examiner must show there is: (1) some suggestion or motivation to modify the reference; (2) a reasonable expectation of success; and (3) the prior art must teach or suggest all of the claim limitations. See MPEP § 706.02(j). Moreover, the reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates v. Garlock,* 721 F.2d 1540 (Fed. Cir. 1983); See MPEP § 2141.02.

In the present case, even though *MacLeod et al.* does disclose the separate embodiments containing the elements of "selecting pixels of the image" and "an arithmetic operation of pixels from more than one than one of said plural planes," the combination of these elements as described in *MacLeod et al.* is incapable of operating according to the invention of Claims 15, 30, 36, and 43.

In the first embodiment of *MacLeod et al.*, as discussed above, the selector plane is used to switch between foreground and background images. (Col. 14, lines 61-63). In this embodiment, the selector plane is stored as a bitmap, a binary pixel map in which pixels can take

one of two values, 1 or 0. (Col. 4, lines 18-19 and lines 8-10). For each pixel in the selector plane, a logical zero value means the pixel value should be taken from the background plane, while a logical one value means that the pixel should be taken from the foreground plane. (Col. 4, lines 45-54).

In contrast with the binary valued selector plane of the first embodiment, the second embodiment of *MacLeod et al.* uses a gray-valued pixel map, in which pixels may have more than 2 values. (Col. 15, lines 9-12). A scale-to-gray operation is performed to create the gray-value pixel map. (Col. 15, lines 3-5). According to the example given by *MacLeod et al.*, "for a 4 to 1 reduction in resolution, the scale-to-gray values range from 0 to 15." (Col. 15. lines 12-14). In this embodiment, the non-binary gray-valued pixel is used to compute the output pixel as a weighted average of the pixels of the foreground and background planes. (Col. 15, lines 9-12).

Because the first embodiment employs a binary-valued pixel for "selecting pixels of the image" and the second embodiment employs a gray-valued pixel for "an arithmetic operation of pixels from more than one than one of said plural planes," it would be impossible to combine these elements as described by the separate embodiments of *MacLeod et al.* in order to produce the invention of Claims 15, 30, 36, and 43. For the first element of "selecting pixels of the image," a binary value is used to select between the foreground and background planes. Not only is there no teaching or suggestion in *MacLeod et al.* for using a non-binary value to perform this selection, but there is nothing in *MacLeod et al.* to suggest how a non-binary value could be used to select between two image planes.

Similarly, for the second element of "an arithmetic operation of pixels from more than one than one of said plural planes," the second embodiment of *MacLeod et al.* uses the non-binary gray valued pixel as the weight in computing the weighted average of the pixels of the

foreground and background planes. There no teaching or suggestion in *MacLeod et al.* for using a binary value to perform a weighted average computation; moreover, there is nothing to suggest how a binary value could be used to perform a "weighted average."

Thus, although separate embodiments of *MacLeod et al.* disclose the elements of "selecting pixels of the image" and "an arithmetic operation of pixels from more than one than one of said plural planes," the reference clearly teaches that these elements are incapable of being operated together according to the invention of Claims 15, 30, 36, and 43. To suggest that the reference teaches the claimed invention merely because they both contain similar components while ignoring the fact that the structure and operation of these components are completely different is contrary to the requirement that the prior art reference must be considered in its entirety, including portions which teach away from the claimed invention. See *W.L. Gore & Associates v. Garlock, supra.* The Applicant therefore respectfully submits that *MacLeod et al.* fails to teach "selecting pixels of the image from one of a single plane and an arithmetic operation of pixels from more than one than one of said plural planes." Accordingly, Claim 15, 30, 36, and 43 are patentable over *MacLeod et al.*

Furthermore, Claims 17-20, 31-33, 37-38, and 45-47 are patentable over *MacLeod et al.* for at least their dependence on independently allowable claims.

III. Response to Rejection of Claim 33 under 35 U.S.C. § 102(e)

The Examiner has rejected Claim 33 as unpatentable over *MacLeod et al.* in view of *O'Mahony.* Applicants submit that Claim 33 is patentable by virtue of its dependence on independently allowable Claim 30.

Furthermore, there is nothing in *O'Mahony* or *MacLeod et al.* to teach or suggest, either implicitly or explicitly, the combination of the references. Applicants respectfully disagree with

the Examiner's assertion that the teachings of O'Mahony, which pertain to a "color CRT display apparatus wherein digital color signals are converted to analog format for controlling the electron beam guns of the CRT," are analogous to the field of the present invention, which "relates to the representation of those digital images in compressed format."

IV. Conclusion

The references cited by the Examiner but not relied upon have been reviewed, but are not believed to render the claims unpatentable, either singly or in combination.

In light of the above, it is respectfully submitted that all of the claims now pending in the subject patent application should be allowable, and a Notice of Allowance is requested. The Examiner is respectfully requested to telephone the undersigned if he can assist in any way in expediting issuance of a patent.

Enclosed is a PETITION FOR EXTENSION OF TIME UNDER 37 C.F.R. § 1.136 for extending the time to respond up to and including January 29, 2002.

The Commissioner is authorized to charge any underpayment or credit any overpayment to Deposit Account No. 06-1325 for any matter in connection with this response, including any fee for extension of time, which may be required.

Respectfully submitted,

Date: January 24, 2002

By: _____
Jonathan M. Hollander
Reg. No. 48,717

FLIESLER DUBB MEYER & LOVEJOY LLP
Four Embarcadero Center, Fourth Floor
San Francisco, California 94111-4156
Telephone: (415) 362-3800

APPENDIX

In the Claims:

15. (Once Amended) A method for reconstruction of an image, comprising the steps of:

selecting pixels of the image to be reconstructed from plural planes of data representing the image[.], wherein said step of selecting comprises selecting pixels of the image from one of a single plane and an arithmetic operation of pixels from more than one of said plural planes.

16. (Cancelled) The method according to Claim 15, wherein:

said step of selecting, comprises,

selecting pixels of the image from one of a single plane and an arithmetic operation of pixels from more than one of said plural planes.

37. (Once Amended) The apparatus according to Claim 36, further [furhter] comprising:

means for decompressing said plural planes and at least one selection mask of the image to be reconstructed.

43. (Once Amended) A computer readable media, storing instructions, that when loaded into a computer, cause the computer to perform the step of:

selecting pixels of the image to be reconstructed from plural planes of data representing the image[.],wherein the step of selecting comprises selecting pixels of the

image from one of a single plane and an arithmetic operation of pixels from more than one of said plural planes.

44. (Cancelled) The computer readable media and instructions according to Claim 43, wherein:

said step of selecting, comprises,

selecting pixels of the image from one of a single plane and an arithmetic operation of pixels from more than one of said plural planes.